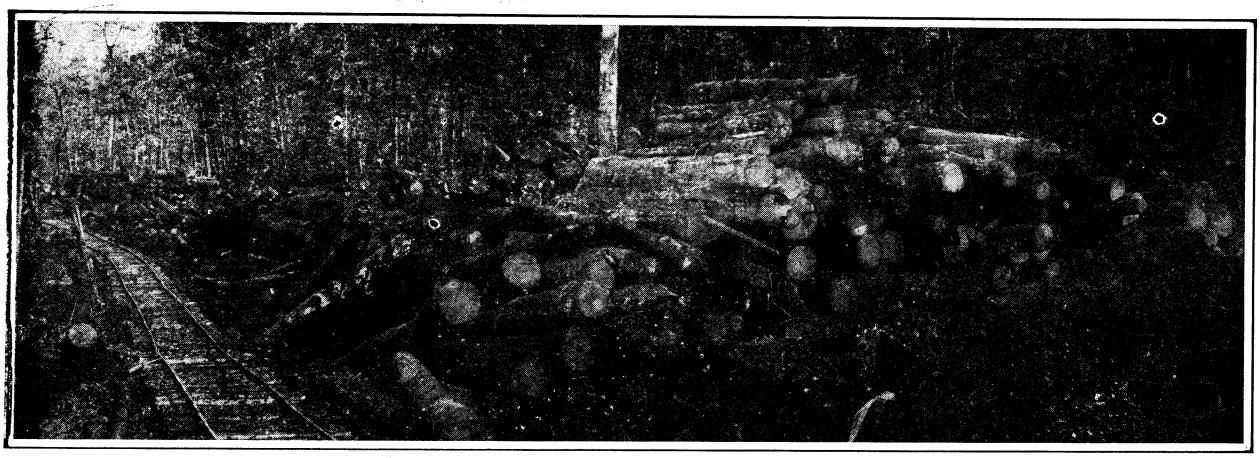
NOVEMBER, 1911

THE LOCOMOTIVE WORLD

LOGGING · MINING · PLANTATION · INDUSTRIAL & STANDARD RAILROAD · MOTIVE POWER

Locomotive Building in Ohio

See Page 3



DECKING LOGS HIGHER means skidding them from a greater distance, consequently requiring less track building, which costs money.

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Clyde Self-Propelling Steam Skidder with "out-haul" system

takes the skidding line back to the logs at a speed of 800 to 1000 feet per minute, which further increases the capacity of each line.

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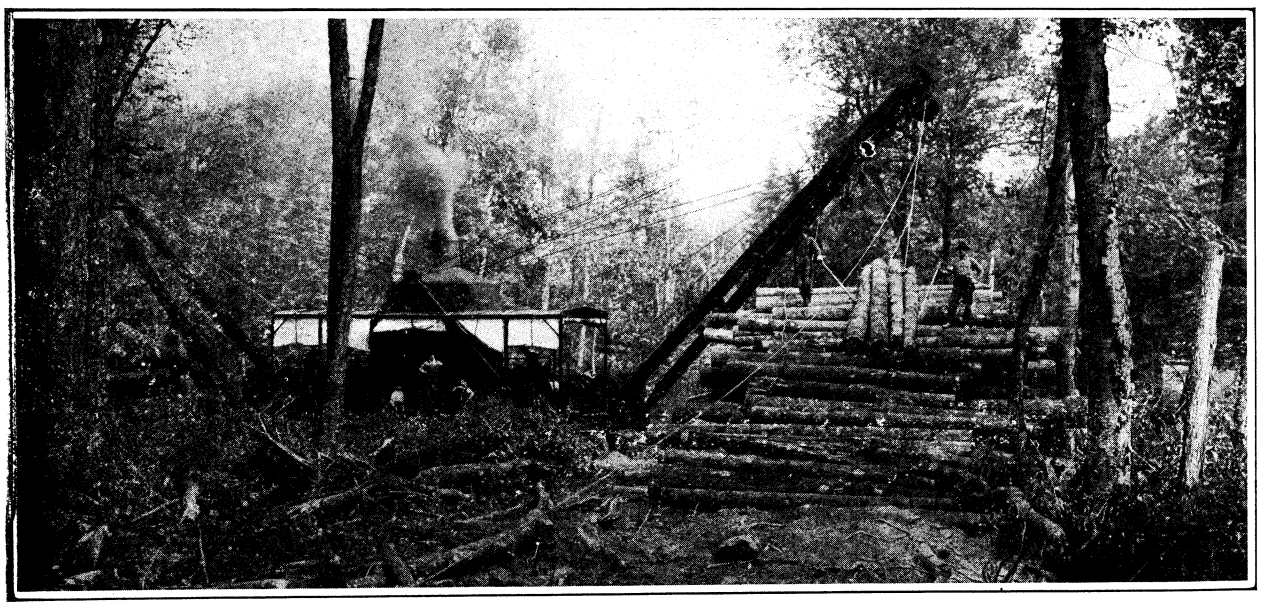

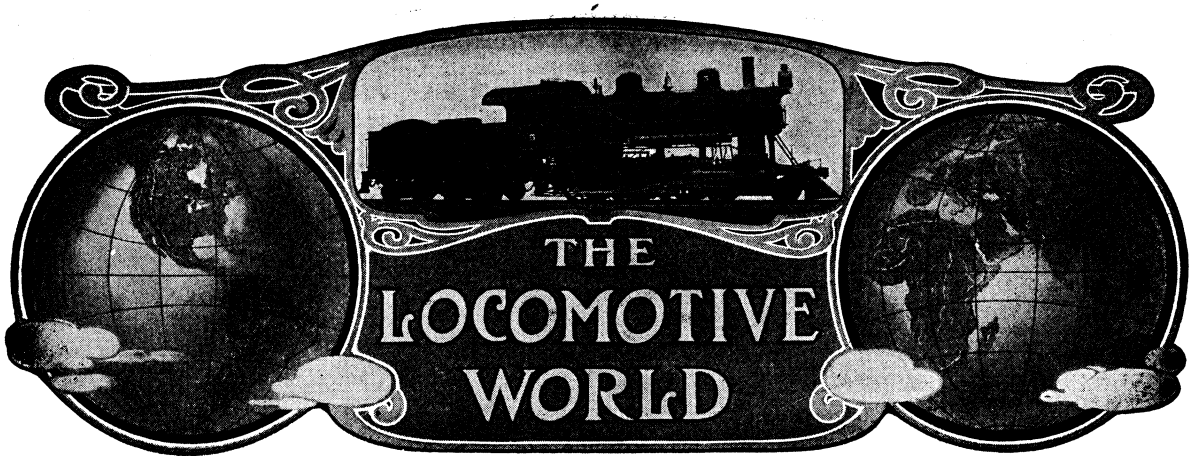

VOLUME 4 NOVEMBER, 1911 NUMBER 7

THE LOCOMOTIVE WORLD.

PUBLISHED MONTHLY BY

THE FRANKLIN TYPE AND PRINTING COMPANY

H. C. HAMMACK, EDITOR

210 N. ELIZABETH ST., LIMA, OHIO.

Devoted to the interest of private users of Locomotives and Equipment for Logging, Mining, Plantation and Industrial Railroads.

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NOTICE TO ADVERTISERS.

Advertising rates fusnished upon application. Change in advertisements intended for a particular issue should reach the office of the Locomotive World no later than the 20th of the month prior to the date of issue. New advertisements requiring no proof can be received up to the 1st of the month of date of issue.

THE FRANKLIN TYPE AND PRINTING COMPANY

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STEAM COMPRESSION IN CYLINDERS.

A CERTAIN amount of space between the end position of the piston in steam engines and the cylinder head is unavoidable, but the smaller the space is the less consumption of steam will occur on account of what is known as compression. The irregularities that occur in engine valves and which speedily lead to a compression of steam causing a higher pressure than that of the incoming steam, is of an injurious effect. Many repeated experiments have shown that an increase of the amount of piston clearance increases the consumption of steam. A moderate degree of compression in a minimum of space is accompanied with a slight improvement in the performance of the engine, but beyond this very limited degree of compression there is a marked increase in steam consumption. The loss is owing to what may be called the anticipatory condensation of the exhaust steam as its pressure and temperture rises during the period of compression.

It can be readily understood that it is more economical to reheat the walls of the cylinder by live steam than by the work of compression, because this work, being derived through a lower degree of efficiency, necessarily involves a large expenditure of heat. The ratio of loss will be in proportion to the ratio of compression to that of the live steam.

With regard to compression aiding in steadying the motion of the piston by providing a cushion to lessen the shock of the piston, which must necessarily come to a stopping point before moving in the opposite direction, it may be stated that any benefit derived from this source has been much overestimated. Those who are familiar with locomotive running while the steam is shut off will readily admit that there is no perceptible shock to the piston at the end of the stroke provided that the main rod and other attachments are in good condition. The question is one which is receiving the serious attention of engine builders and the tendency is to reduce the clearance space to the nearest point to absolute safety and the degree of compression to much less than that of the incoming steam.—*Railway and Locomotive Engineering.*

HEATED BEARINGS.

Heating of locomotive bearings is not a common occurrence at this season of the year; this trouble gives the most annoyance in summer when an increase in temperature approaches. In addition to the greater heat of the atmosphere there is also a marked increase in the amount of dust incident to all vehicular traffic in dry, warm weather. The heavy particles of sand and other substances of an abrasive kind that rise with the dust, are apt to get in between the rubbing surfaces of the bearings. This may cause cutting of the bearing and may be impossible to discover without removing the bearing. Whatever the cause of the heating of the bearing may be, a liberal supply of oil should be applied, and if water pipes are attached, those leading to the heated box or bearing should be opened and a stream of water poured upon the heated parts.

If the heating continues, and if the trouble is in a driving box, it should be examined to see if the wedge is jamming the driving box. The slight expansion of the box and wedges, owing to the increased degree of temperature, may be sufficient to bind the box in the wedges, in which case the wedge should be slightly loosened, care being taken not to loosen the wedge too much, which may lead the way to frame breakages and other troubles, and also remembering to set the wedge up again in its proper place when the box has sufficiently cooled. If lubrication and cold water and wedge-loosening does not have a permanent effect in cooling the box, a remedy may be found in relieving the bearing of some of the load resting upon the box. Wedges should be carried on the locomotive suitably formed, so as to be readily driven in the space between the frame and spring saddle. A slight raising of the saddle will considerably diminish the weight on the bearing.

In the case of overheating the rod brasses the matter may be more readily handled, but there is an added trouble in the readiness with which babbitt will melt in the brasses before any evidences of heating may have come to the notice of the locomotive engineer. Under such conditions it is generally advisable to keep the engine running until the babbitt is all melted out. Any attempt at cooling while the babbitt is in the melted state rarely fails to close up the oil holes and adds to the work to be done. A loosening of the rod key and liberal lubrication generally has the desired effect, with water cooling if necessary.

In regard to the heating of eccentric straps, it should be remembered not to suddenly cool a heated cast iron eccentric strap with water. The tendency to crack the strap is very great. The best method is to slacken the bolts joining the two halves of the eccentric together and insert one or more tin liners. Lubricate well, and do not move the reverse lever until the strap is fairly cooled.—*Railway and Locomotive Engineering.*

TRADE CATALOGUES.

We wish to acknowledge receipt of Power & Transmission Catalog No. 50 from the Jeffrey Mfg. Co., Columbus, Ohio. This, we believe, to be the most complete and up to date Power and Transmission Catalog that is in existence, that is to say, there are more subjects listed and there is more technical and real information in this book than in any other publication. It is true that it is not as thick as some of the other books on power and transmission, but at the same time they have condensed the matter listing the complete line, giving the entire information in a way that will make this book exceedingly valuable to the engineer in charge of an industrial plant, a mine, mill, or large factory where this class of machinery is used.

Besides listing dimensions and sizes of every part in this line, they give descriptive matter on the horse powers of steel shafting, standard methods of key seating, sizes and dimensions of couplings, hangers, pulley blocks, counter shafts, belt tighteners, clutches and quills.

A feature is made of the Jeffrey Improved Split Iron Pulley which may be readily clamped on the shaft without disturbing any other equipment, or may easily be removed from the shaft when necessary.

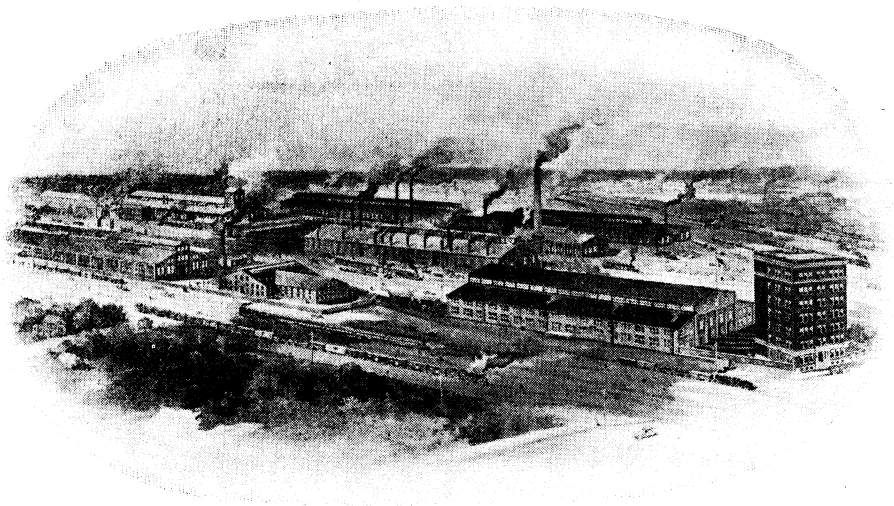
A complete line of wood split pulleys and a very complete description and information on rope driving are shown.

One of the features of this book is the complete listing of the Jeffrey gears, including spur, bevel, miter, angle reduction and angle miter.

There are quite a number of details in the rear part of the book including H. P. of belts, method of calculating bending and torsional moments for shafts, which are invaluable to the engineering fraternity.

Locomotive Building in Ohio

IN Lima, Ohio, a town of over 35000 inhabitants, is located one of the most progressive locomotive building plants in the United States. In fact, it is the third largest locomotive company, and in reality the second largest independent plant in existence in America today. This company is styled The Lima Locomotive & Machine Company, and its inception dates back over thirty-two years ago. Like all other locomotive building plants, it was called into existence by some special need for improvement in some particular line, and the reason for the founders taking up locomotive building was through an early requirement for a "Logging Locomotive" or in other words a locomotive to work on a cheap tram-road to haul logs from the woods and to displace a less economic method of doing the work, that of hauling the logs

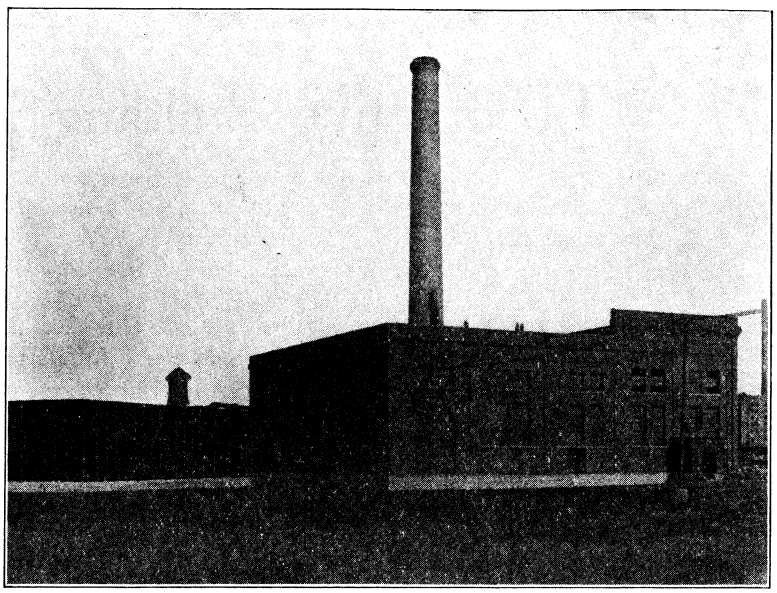


VIEW OF PLANT OF THE LIMA LOCOMOTIVE & MACHINE COMPANY

on wagons and sleds by oxen and horses. The original founders of the works, like Matthias W. Baldwin, started their career building other kinds of machinery. Their line being general saw mill machinery, instead of stationary steam engines, as was Mr. Baldwin's line; hence the reason for their first work in locomotives being for lumber field. The plant as originally founded was not in its present location, but was on East Market Street in Lima, and was moved to its present location in 1902. The first locomotive constructed by this company was built and shipped in 1879. It was a 4-4-0-8 type and was sold to J. W. Sloss a lumberman in Northern Michigan. This started the era of progress for this concern, as from the beginning it has been moving forward with a gradual development. It will be noted that the first locomotive built by this firm was a direct acting engine, but just about a year after the first locomotive was shipped this Company brought forth the Shay geared locomotive, named after the inventor. Considerable attention has always been given the construction of this special locomotive, and today it is the only all-around successful geared locomotive on the market and only geared locomotive recognized by the railroads, yet the company have always given a great amount of attention to the building of the regular rod or direct locomotives such as are used on trunk line railroads.

The location of the plant of the Lima company is on a site lying between the Cincinnati, Hamilton & Dayton R. R., the Lake Erie & Western and Erie Railroads, and connecting tracks

are built to each of the three roads, which afford excellent facilities for getting in raw material as well as shipping out the finished locomotives. The buildings are all connected by a system of yard tracks so that material can be transported from one shop to another in an economic and speedy manner. The entire plant has a complete sewerage, fuel gas and water system; the various buildings are heated by hot air system installed by the American Blower Company, and lighted by electricity supplied by a private electric light plant. The yards are also lighted by electricity by this plant.



NEW POWER HOUSE, LOOKING NORTH

This is a complete locomotive plant and one which can be extended with advantage, as each building is so arranged that it can be enlarged without encrouching upon another.

Improvements amounting to over a half million of dollars have recently been completed. These improvements comprise a new Power Plant and Foundry, photos of which are herein illustrated. The photos hardly do justice, and to give the readers a more comprehensive idea of the extent of same the writer will endeavor to give a brief description of these two new additions of the plant as well as other shops comprising the works.

POWER HOUSE AND EQUIPMENT.

BUILDING.

The power plant is built of red brick on concrete foundations. The floors in basement and boiler room are of concrete, in engine room of Terrazo. The engine room is lined with a high grade yellow pressed brick. The building is 120 feet long by 130 wide and is 51 feet high over boiler room and 43 high over engine room; and so arranged that it may be extended in a southerly direction to provide for additional power.

COALING PLANT.

The Coaling Plant consists of a large hopper having a capacity of 50 tons of coal which feeds at the bottom to a transverse conveyor which carries coal into the power house and to the top of the coal crusher. The coal crusher crushes all coal to 2-inch cubes or under. The coal is then elevated by a bucket conveyor to the top of the power house where it falls on a belt conveyor which carries it along the bin to the desired point. The bin is of the parabolic type and is supported only at the upper edges. It has a capacity of 600 tons. There are outlets from the bin in front of each boiler with provision for future boiler installations.

The Coaling Plant was designed and installed by Phillips-Lang & Company of Chicago, using C. W. Hunt's material; it has a capacity of 40 tons of coal per hour.

BOILERS.

The Boiler Equipment consists of two 400 H. P. Vertical Wickes; one 500 H. P. Heine; and two 250 H. P. Scotch Marine Boilers. The three boilers first mentioned are equipped with Detroit stokers and the spouts from the coal bin feed directly into the stoker hoppers so that it is not neces-

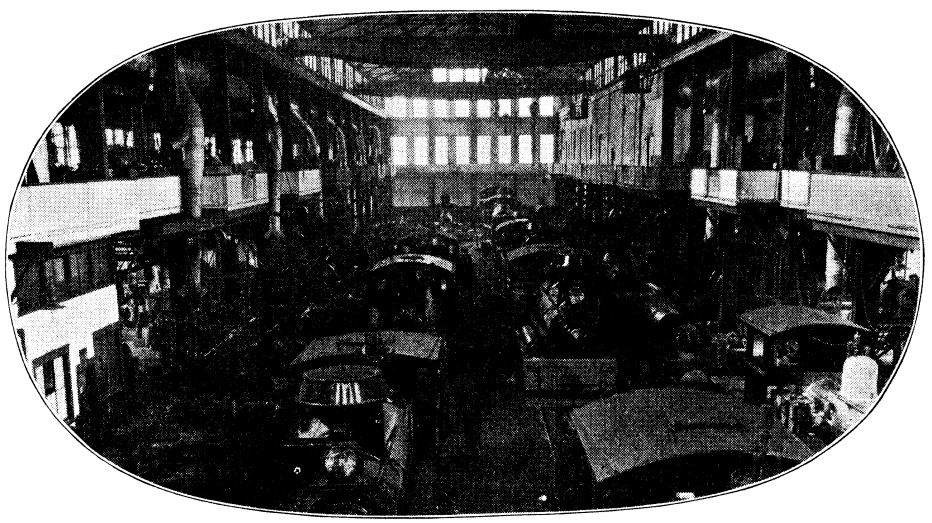
sary to handle the coal at all from the time it leaves the car until it is actually placed on the boiler grates. Space is provided in the power house for an ultimate installation of 4000 H. P.

A chimney 10 feet inside diameter at top and 175 feet high is provided to insure ample draft. This chimney is built of hollow radial brick manufactured by the N. W. Kellogg Co., of New York City.

The ash handling equpiment consists of hoppers under each grate, terminating in an ash gate made by the Link-Belt Company. Under these ash gates there is a dump car on rails which run under all of the boilers. The ashes can be dumped into this car and taken to the end of the building where there is a pneumatic elevator manufactured by the Curtis Company of St. Louis. This elevates the ash car to the ground level where it can be moved on industrial track and dumped wherever filling is desired.

ENGINE ROOM.

The main generator is a 750 K. W. 250 Volt D. C. Generator manufactured by the Sprague



INSIDE VIEW OF ERECTING SHOP

Electric Company. This is driven by a 1200 H. P. Cross Compound Condensing Corliss engine manufactured by the C. & G. Cooper Company of Mt. Vernon, Ohio. This engine has high and low pressure cylinders; high pressure 26 in. diameter, 48 in. stroke; low pressure 48 in. diameter, 48 in. stroke. There are also two 300 H. P. Simple Non-Condensing Buckeye engines driving 200 K. W. 250 Volt Generators manufactured by the Sprague Electric Company.

The air supply is provided by a Cross Compound Condensing Corliss Steam End manufactured by the C. & G. Cooper Company and an Ingersoll-Rand Air End having a capacity of 3000 cubic feet of free air per minute. The condensing equipment consists of a cooling tower with pump and a barometric condenser of the Baragwanath type. The condensing equipment was installed by the E. A. Field Co., of Detroit. The foundation of the cooling tower is utilized to install a large pond for use as a fire reservoir. This pond has a capacity of 150,000 gallons.

The Feed Water Heater is manufactured by the Webster Mfg. Co., of Camden, N. J., and has an ultimate capacity of 40,000 pounds of water per hour.

The boiler feed pumps, of which there are two, were manufactured by the Platt Iron Works of Dayton.

The general piping of the power plant was done by the Evans-Almirall Company of New York and Chicago. The piping is so arranged that any of the engines may be run non-condensing, or the large engines mentioned may be run condensing. In winter when heat is necessary in the shops one of the large engines is run non-condensing to provide exhaust steam for heating. The exhaust steam pipes and high pressure steam pipes, the air pipes and water piping and the electric wiring

are all carried in a concrete tunnel eight feet wide and nine feet high extending the length of the plant. This tunnel has entries to every important building and the important pipes are so installed that it is possible at any time to get at any portion of them for examination or repairs.

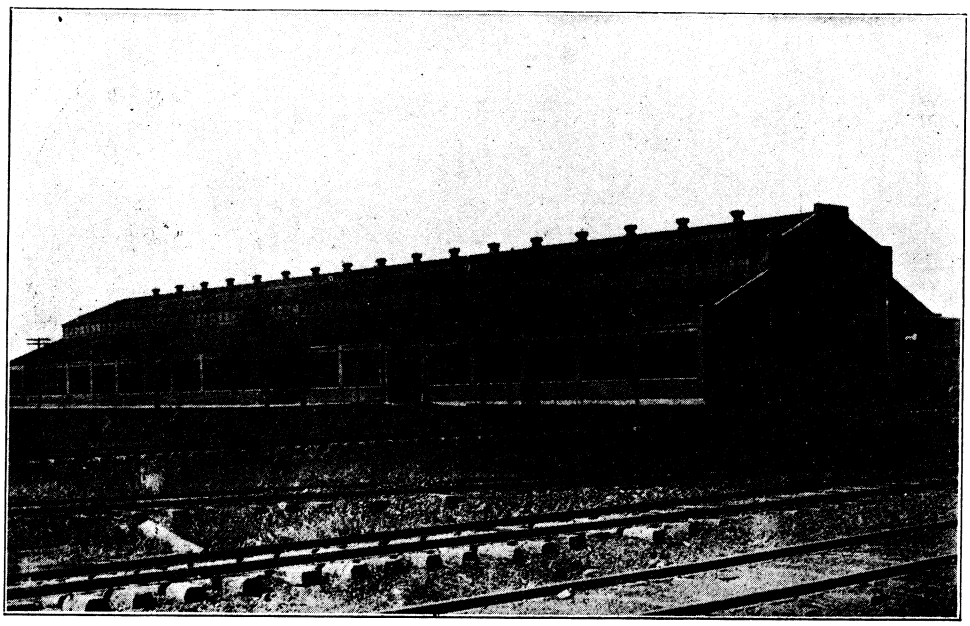
The feed water system to the boilers consists of a complete ring around the boilers and it is possible to feed any of the boilers by two pipes so that a break at any point in the feed line would not put the plant out of commission, as any boiler can be fed from either pump. There are duplicate headers so an accident to one header would not prevent the operation of the plant.

Space is provided in the plant for the installation of another large 1200 H. P. engine and another large compressor.

FOUNDRY.

The Foundry building is 120 feet wide and 380 feet long. This width is divided into one center bay 60 feet wide, and two side bays of 30 feet each.

Two cupolas are provided, one having a capacity of 10 to 12 tons per hour; the other 5 to 6 tons per hour.



NEW FOUNDRY OF THE LIMA LOCOMOTIVE & MACHINE COMPANY

There are two elevators so that any accident to one will not stop the operation of the cupola.

The charging floor at the cupola is provided with numerous turn tables so that cars brought up on the elevator can be run to either cupola or placed at any desired position.

The draft is furnished by a General Electric Centrifugal Blower.

The core room is provided with four large ovens and a number of small ones. The core ovens being fired by oil to obtain an even, regular heat.

A 15-ton electric traveling crane is provided for the central bay; a 5-ton hand electric crane for one of the side bays; and 2-ton hand operated cranes are provided for the Core Room, Brass Foundry and Cleaning Room.

Industrial tracks are used freely throughout the plant with numerous turn tables so that ladels of the molten metal or cars of material may be readily moved to any part of the plant on the tracks.

The Brass Foundry is provided with a special brass tumbler, three crucibles, and one of the most approved types of Tilting Furnaces.

The Cleaning Room is equipped with six Exhaust Steel Plate Tumbling Mills of various sizes

and a number of emery wheels and air hammers. The exhaust from the tumbling barrels is led through a dust arrester so that all dust is removed and deposited outside of the building in bins. A Pangborn sand blast is provided for large castings which cannot readily be tumbled. The sand blast room is also connected to the dust arrester so that the sand blast room is kept unusually clear of dust.

This foundry has a capacity of between 40 and 50 tons per day of high grade gray iron castings.

The roof is a concrete roof thoroughly waterproof.

A locker room with expanded metal locker is provided for the employees, also a number of shower baths and elaborate toilet facilities. A full equipment of wash bowls are provided in the locker room.

MACHINE SHOP AND ERECTING SHOP.

The Machine Shop and Erecting Shop is of steel construction 120 x 340 feet with side and end walls of brick and with a tile roof. The middle span of the building is 60 feet wide and 38 feet from the floor line to the top of the crane track. On each side of the building there are two story bays 30 feet wide on which floors are the machine tools. The middle span is used for erecting purposes, having four tracks, running the full length of the building of sufficient capacity to handle thirty locomotives at one time while in process of erection. This erecting floor is served by two electric cranes of sufficient capacity to handle the largest size locomotives. There is a cement floor on the ground and a slow burning floor on the second story of the side bays, making the entire structure as near fire proof as possible.

BOILER SHOP

The Boiler Shop is 120 feet x 240 feet; is of steel frame and constructed with brick sides and tile roof. The center span is 60 feet wide and the two side spans 30 feet wide. At the north end is the erecting tower for Hydraulic Riveting Plant; also building containing the oil furnace for flanging press. A large electric crane travels the whole distance of the center bay, while several smaller traveling cranes operate on the side bays. This shop is supplied with all the most modern tools, two hydraulic riveters, one 50 and 150 tons capacity, one 250-ton hydraulic flange press, Allen's compressed air riveters, stay bolt breaker, and all the usual punches, shears, rolls, etc. All of the large tools, such as bending tools, punches, etc., are driven by motors attached to the tools. The smaller ones are driven by a belt from the line shaft which is also driven by a motor.

BLACKSMITH SHOP

This Shop is 74 x 165 feet; is of brick construction and slate roof. It is equipped with all modern oil and gas furnaces and the latest design forges, steam hammers, forging machines, etc.

MILL BUILDING

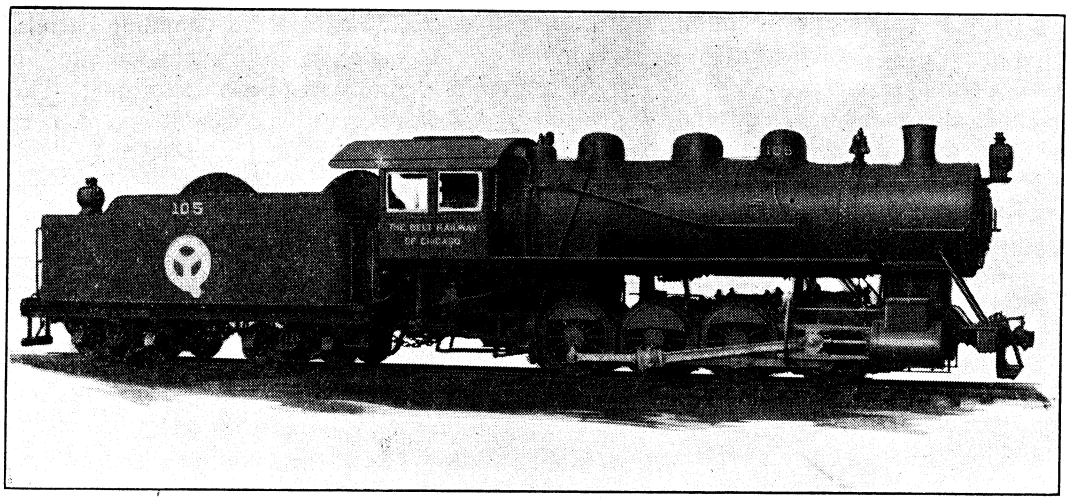
The Mill building is 70 feet x 200 feet; is a brick structure with slate roof. It is used as a planing mill and wood working department and is equipped with the various machines used for this purpose, together with a shaving exhaust system, keeping it free from shavings and dust at all times.

PATTERN STORAGE BUILDING

The Pattern Storage building is 60 feet x 200 feet; is of brick construction, with tile roof supported by steel trusses. There are no outside windows, the light coming wholly from skylights in the roof, the building being fire proof.

The plant is equipped throughout with the most modern and up-to-date locomotive building tools and appliances and is designed with a view of competing with the largest locomotive builders in the country, and to enable them to step into all of the "Markets of the World." It has a capacity of from seven to eight locomotives per week.

The locomotives manufactured by this company will be found working in all parts of the globe—Australia, England, South America, Tasmania, Central America, Porto Rico, China, Cuba, British Columbia, Nova Scotia, Japan, Alaska, Canada and Mexico, also every state in the Union.



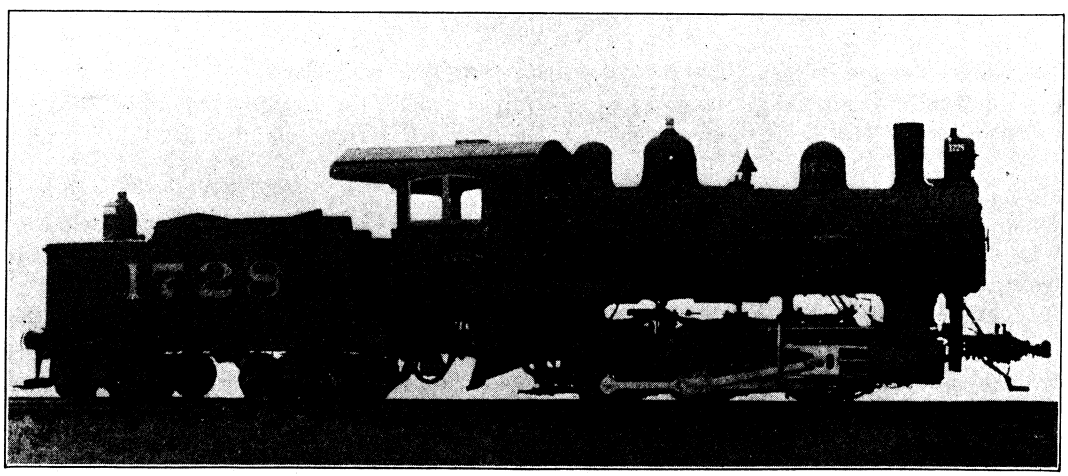
NEW SWITCHING LOCOMOTIVE FOR CHICAGO BELT LINE

Foreign agencies have been established in all foreign countries, and the annual sales of said Company now aggregate a sum of $3,000,000.00.

The offices of said company are located in a seven story office building, constructed of re-inforced concrete and brick facing. This is a magnificent building and owing to its peculiar construction, with windows on four sides, there is every advantage of sun light and air accorded the officers and their army of assistants.

Some of the recent achievements of this company are ten 101-ton 24 x 28 cylinder 8-wheel switcher locomotives for the Chicago & Western Indiana Ry., of which the American Engineer and Railroad Journal has the following to say:

The heavy character of the switching requirements on the Chicago & Western Indiana Ry. has brought about a remarkable development in locomotives intended exclusively for this service. A prominent example of this increase in size, weight and power may be found in the engine herewith illustrated, which is one of ten recently built for this road by the Lima Locomotive and Machine Co. of Lima, O. While not embodying any particular departures in constructive details these locomotives are noteworthy for their total weight of 202,000 lbs, or approximately 50,000 lbs per axle, and for the comparatively large diameter of driving wheels



ONE OF THE FIFTEEN SWITCHERS FOR SOUTHERN RAILWAY

employed, which is 57 inches. The tractive effort is 43,290 lbs, providing ample power for the service.

The latter on the Belt Line imposes some rather peculiar conditions which must be met in switch engine design, and prominent among these is the fact that in addition to the requisite of a locomotive of great power it must necessarily be one capable of more than the average speed for this type of locomotive. This, of course, is demanded by the congestion on the Belt Line arising from the presence of so many passenger trains of the various roads which use it. Switching operations must therefore be conducted expeditiously in order that no interference may exist with the above mentioned important traffic.

Since being placed in service these locomotives have been giving excellent satisfaction, and the railroad company is well pleased with the first-class material and workmanship embodied in their construction. The builders made quite a record with this contract, which is deserving of mention. The order was given by the railroad company on November 7, 1910, and shipment was stipulated at the rate of five locomotives during the month of February, 1911, and five during the month of March. The last of the ten engines left the Lima Works on March 30, on exact time agreed upon.

The following are the principal dimensions of these locomotives:

GENERAL DATA.

Gauge	4 ft. 8½ in.
Service	Switching
Fuel	Bit. Coal
Tractive power	43,290 lbs.
Weight in working order	202,000 lbs.
Weight on drivers	202,000 lbs.
Weight of engine and tender in working order	342,500 lbs.
Wheel base, driving	15 ft. 6 in.
Wheel base, engine and tender	51 ft. 4 in.

RATIOS.

Weight on drivers ÷ tractive effort	4.64
Tractive effort × diam. drivers ÷ heating surface	.823
Total heating surface ÷ grate area	72.7
Firebox heating surface ÷ total heating surface, %	5.5
Weight on drivers ÷ total heating surface	67.4
Volume both cylinders	14.62 cu. ft.
Total heating surface ÷ vol. cylinders	205
Grate area ÷ vol. cylinders	2.81

CYLINDERS.

Kind	Simple
Diameter and stroke	24 x 28 in.

WHEELS.

Driving, diameter over tires	57 in.
Driving journals, main, diameter and length	10 x 13 in.
Driving journals, others, diameter and length	9½ x 13 in.

BOILER.

Style	E. W. T.
Working pressure	180 lbs.
Outside diameter of first ring	74⅜ in.
Firebox, length and width	108 1-16 x 60¼ in.
Tubes, number and outside diameter	327—2¼ in.
Tubes, length	14 ft. 9—9-16
Heating surface, tubes	2,832.14 sq. ft.
Heating surface, firebox	165.95 sq. ft.
Heating surface, total	2,998.09 sq. ft.
Grate area	41.2 sq. ft.

TENDER.

Water capacity	7,400 gals.
Coal capacity	11 tons

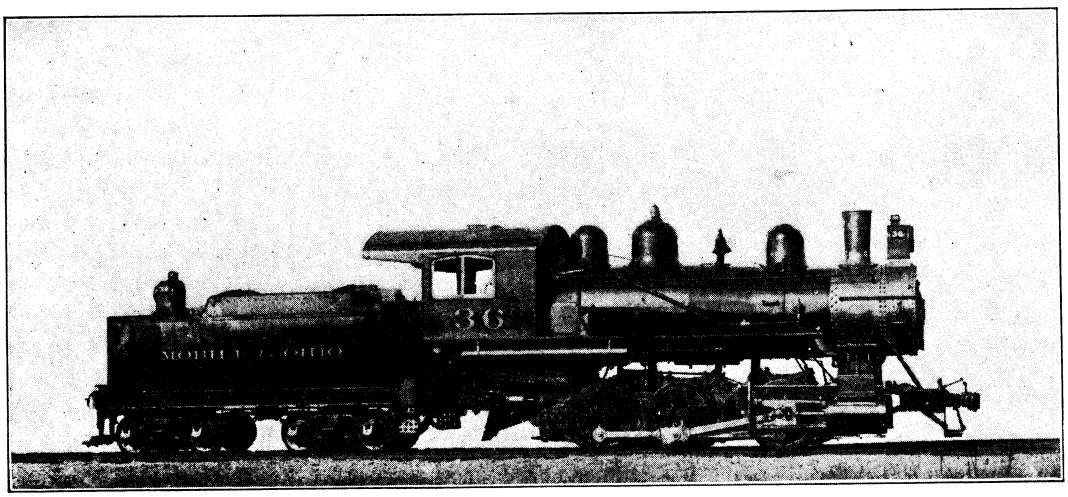
Fifteen 20 x 26 Switcher locomotives for the Southern, and eight 20 x 26 switching type locomotives for the Mobile & Ohio. These locomotives were built after the following description:

SOUTHERN RAILWAY LOCOMOTIVES.

Simple or compound	Simple
Weight on drivers	145500
Total weight	145500
Cylinders	20 x 26
Diameter of drivers	51"
Type of boiler	Ext. W. Top
Working steam pressure	185 lbs.
Heating surface, tubes	2376
Heating surface, firebox	110.5
Heating surface, total	2486.5
Tubes, number	300
Tubes, outside diameter	2"
Tubes, length	120"
Firebox, type	Wide
Firebox, length	65⅛"
Firebox, width	65¼"
Grate area	29 sq. ft.
Tank capacity	4500 gals.
Coal capacity	14000 lbs

SPECIAL EQUIPMENT.

Axles	Steel
Bell Ringer	Vissering Golmar
Boiler lagging	Magnesia
Brakes	New York Air, LT Equipment.
Brake beams	Waycott
Brake shoes	Perfecto steel back
Couplers	McConway & Torley
Driving boxes	Cast steel
Headlight	2 Schroeder lights
Injector	Hancock No. 10
Journal bearings	Brass
Packing	Paxton-Mitchell
Safety valve	Consolidated
Sanding devices	Viloco AL 101
Sight-feed lubricators	Michigan Triple
Springs	Steel
Staying	Tate stays
Steam gages	Ashton No. 66
Tires	Midvale Steel
Tubes	Coatesville Knobbled Charcoal iron (lap welded)
Valve gear	Stephenson
Wheel centers	Cast steel

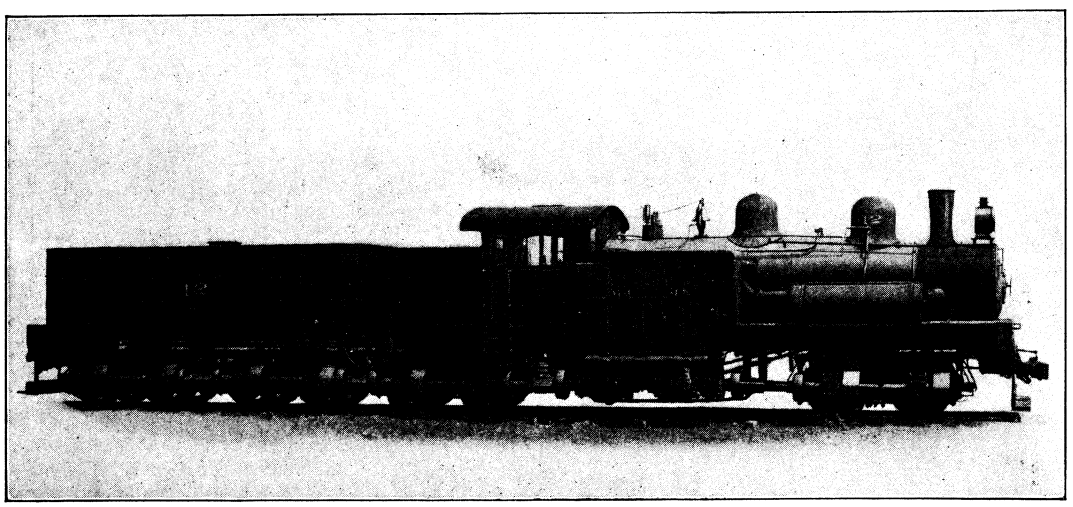


SWITCHERS FOR MOBILE & OHIO. EIGHT ON ORDER

Two 150-ton Shay Geared Locomotives supplied to the Chesepeake & Ohio Railway, which company have now in operation thirteen locomotives of this size and type. The following is description of the 150-ton Shay:

150-ton Shay Locomotive.

Simple or Compound	Simple
Weight on drivers	348000
Total weight	348000
Cylinders	3-17″ x 18″
Diameter of drivers	46″
Type of boiler	62-3/8″ Ext. W. T.
Working pressure	200 lbs.
Heating surface, tubes	2204
Heating surface, Firebox	178-½
Heating surface, total	2382-½
Tubes, number	310
Tubes, Outside diameter	2″
Tubes, Length	13′ 6″
Fire Box, Type	Straight side, sloping crown
Firebox, length	114″
Firebox, width	61¼
Grate Area	48.48 sq. ft.
Tank capacity	8000 gals.
Coal capacity	18000 lbs.
Brakes	New York air, Type LT
Couplers	Tower
Headlights	C & O Std.
Injectors	Hancock No. 10
Packing	Jerome
Safety valves	Crosby
Sanding devices	Watters air
Sight feed lubricator	Nathan Bulls Eye—4 feed
Steam gages	Ashcroft
Tires	Crucible steel
Tubes	Worth Bros. Charcoal Iron

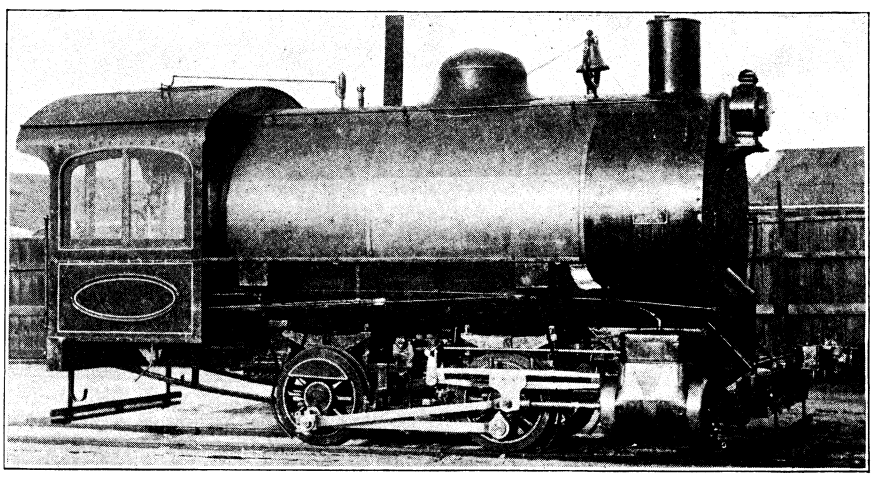


ONE OF THE THIRTEEN 150-TON SHAYS FURNISHED CHESAPEAKE & OHIO RAILWAY

The Steam Storage Locomotive, two of which have been furnished to the National Cash Register Company of Dayton, commonly called "Fireless Locomotives." The Railway & Engineering Review in a recent issue have the following to say in connection with these Storage locomotives built by the Lima Locomotive & Machine Company:

German engineers have for some time been taking advantage of the economy possible in the use of the steam-storage or fireless locomotive as a means of performing switching service in and about industrial plants. Until recently American designers have looked exclusively to the use of electric or compressed air engines for work of this nature when it was not desirable to use the ordinary steam locomotive. Appreciating the possibility of the fireless engine, the National Cash Register Co. of Dayton, Ohio, has secured from the Lima Locomotive & Machine Co. what is believed to be the first machine of this character built and adapted to shunting service in this country.

The locomotive referred to is of the 0-4-0 type and as respects frames, cylinders, and running gear, is not dissimilar to the usual 0-4-0 saddle tank locomotive with which we have become familiar, and which is so largely used by contractors. With respect to the boiler, however, this engine



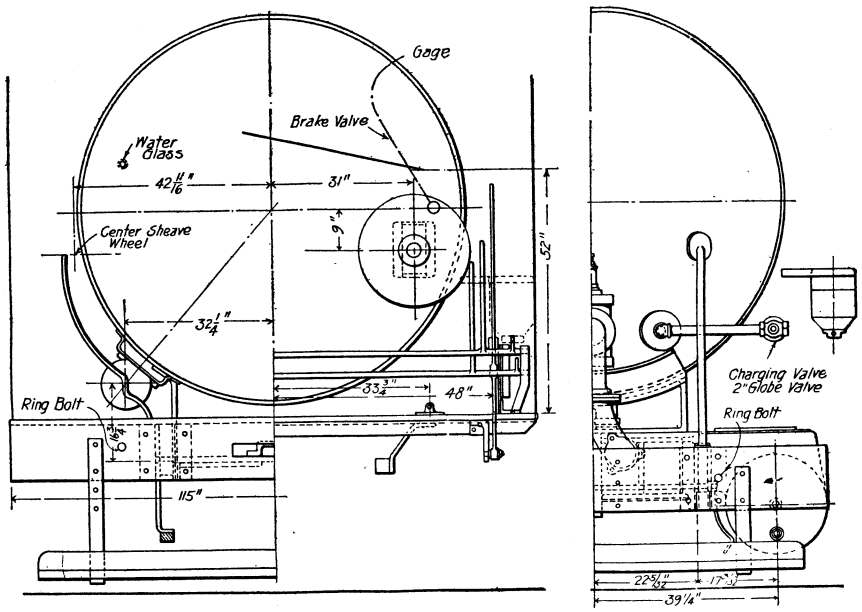
*STEAM STORAGE LOCOMOTIVE BUILT BY THE LIMA LOCOMOTIVE & MACHINE COMPANY

has substituted therefor merely a large tank, fitted only with such apparatus as is required for the control of the flow of steam to the cylinders. The tank is 84 ins. in external diameter and is 16 ft. in length and has a capacity of 530 cu. ft., and has mounted upon it a 30-in. steel dome, inside of which the usual form of throttle valve is placed, and from which a 4-in. steam pipe leads through a reducing valve to the steam chests. To reduce the loss from radiation as much as possible, the tank is heavily lagged.

In preparing the engine for operation, the practice is to fill the tank about half full of water, after which steam from a stationary boiler plant is charged into the tank through a 2-in. charging pipe located well below the water level. The end of the charging pipe is capped and the steam is made to escape through a series of holes drilled through the underside of the pipe. By the time the pressure between the generating plant and the locomotive is equalized, which may be at anywhere from 125 to 200 lbs., depending on the pressure at the central station, the water level in the tank will be considerably raised and the temperature of same will be very nearly equal to that of the steam by which it has been charged. The pressure at the cylinders is reduced to about 60 or 65 lbs. per square inch by means of the valve previously referred to, the cylinders being made sufficiently large, 18 ins. in diameter by 18-in. stroke, to develop a tractive power in proportion to the

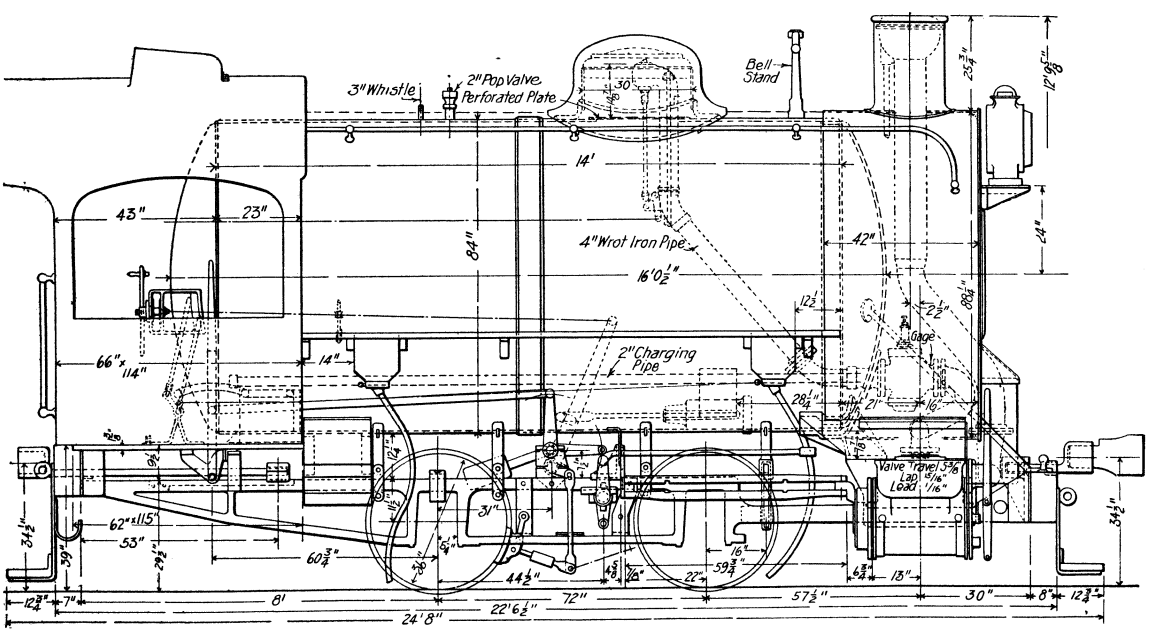
*Cut used by permission of The Railway and Engineering Review.

adhesive limit of the engine. As the steam is used the pressure in the tank becomes less, allowing the water to gradually evaporate and maintain a steam supply until it has been depleted to the point where it is no longer effective. The period of service available from one charge of the engine varies from two to ten hours depending, of course, on the amount of work required during that interval. The insulation of the tank is sufficiently effective, it is claimed, to prevent a loss of not more than 3 to 4 lbs. pressure per hour, but the large diameter of the cylinders makes it possible to move the engine under its own power at pressures as low as 4 lbs, per square inch; from which it will be seen that the engine is enabled to return to the power house under its own power, for recharging, even though its capacity for doing effective work has been exhausted.



*CROSS SECTIONS, STEAM STORAGE LOCOMOTIVE, BUILT BY THE LIMA LOCOMOTIVE & MACHINE COMPANY

Owing to the fact that cylinders are designed for low pressure, it becomes necessary to protect them from the full pressure of the tank in case of a possible failure of the reducing valve and for this purpose relief valves are provided. The exhaust from the cylinders is carried out through a stack, resembling very closely the usual type for small locomotives, in which there is mounted an



*ELEVATION, STEAM STORAGE LOCOMOTIVE BUILT BY THE LIMA LOCOMOTIVE & MACHINE COMPANY

*Cuts used by permission of The Railway and Engineering Review.

exhaust head of the Swartout centrifugal type for the purpose of extracting the waterof condensation from the vapor before being discharged to the atmosphere. Steam distribution is effected by means of slide valves actuated by the Stevenson gear. A steam brake is applied, and the brake cylinder, being adapted to the use of low pressure, requires likewise an independent reducing valve, so that braking may be effected after the throttle valve is closed. The steam brake is supplemented by means of a hand brake having connection with the same lever to which the piston of the steam cylinder is attached. The wheel base of the engine is 72 ins., the wheels are 36 ins. in diameter, and the total weight when fully charged is 77,100 lbs., all of which, of course, is on the drivers. The weight of the engine empty is 51,600 lbs.

Within the tank, for the purpose of reducing as much as possible the surging of the water from one end to the other and thus disturbing the equalization of the weight on the drivers, there is placed a series of large baffle plates with restricted openings, by which means undesirable rocking of the engine is avoided.

The company at present is engaged in building ten 20 x 26 Switchers for the Grand Trunk Railway System, five 20 x 26 Switchers for the Erie Railroad and five for the Akron, Canton & Youngstown R. R., three 19 x 26 and two 21 x 26.

The company manufactures all classes of locomotives, from the smallest mining and plantation locomotives to the large freight and passenger locomotives in service on our trunk line railroads, besides manufacturing the Lima Steam Storage Locomotive, adapted for use around Industrial Plants, Powder Mills, Cotton Mills, Lumber Plants, etc., where absolute safety as to fire is desired; also the special Shay Geared Locomotive, which long ago has demonstrated its adaptability as a mountain climber and for steep grades and sharp curves.

The men who direct the affairs of this large corporation are: A. L. White, President and General Manager, I. P. Carnes, Vice-President, W. T. Agerter, Secretary-Treasurer, G. L. Wall, Assistant General Manager and Mechanical Engineer, C. W. Werst, Works Superintendent, H. C. Hammack, General Sales Agent, and James Davis, General Foreign Sales Agent, Chas. P. King, Manager New York Office, and A. E. Rosenthal, Manager Chicago Office.

THE FAILURE OF LOCOMOTIVE CROWN SHEETS.

The enactment of a federal law for locomotive boiler inspection makes the subject of the causes of boiler failures of timely interest. The most complete and reliable statistics relating to locomotive boiler explosions, failures and casualties are found in the 1910 report of the Master Mechanics' committee on the Inspection of Locomotive Boilers. They cover a period of nearly five years from January 1, 1905, and represent 75 per cent of the locomotives of the country. When equated for the whole number of locomotives, estimated at 58,000, they will fairly represent the total number of boiler failures which are in the nature of an explosion. The equated figures show a total of 800 failures per year. It should be understood that the figures cover only those failures which resulted in personal injury or death, and the total number of failures, including those in which there was no personal injury, is still larger. Of these, 5 were due to explosions of boiler shells; 68 to explosions of fireboxes, and 700 to damage by burning. Those due to explosions of fireboxes and to damage by burning may be considered as crown sheet failures, since as a rule they are confined to the crown sheet. We, therefore, have a total of 768 failures of crown sheets per year causing personal injury, and an additional number not reported which did not result in personal injury.

The report shows that 98.3 per cent of the failures were due to low water, and all of these, with the exception of 1.4 per cent, were caused by the neglect of the men in immediate charge of the locomotive to maintain a proper supply of water in the boiler. The only real locomotive boiler explosions which may be charged to the weakness of the boiler are those classed as explosions of the boiler shell, and the average number per year for all the engines in the United States is 5.6, or less than 1-100 of 1 per cent of the locomotive boilers in service,

which is smaller than in any other service, stationary or marine.

The serious damage to locomotive boilers is, therefore, largely due to the failure of crown sheets and, including those which do not cause injury to persons, the average number in the United States per year is now probably 1,000, or about 2 per cent of the locomotives in actual service, and the number is increasing Over 98 per cent of these failures are chargeable to the enginemen. Under such conditions there is little hope for any very substantial improvement by any change in boiler design, by the use of better material, or by more efficient inspection. To make the boiler stronger would only increase the violence of the explosion if it should occur; the practice on some roads is to use crown bolts without heads, so that when the sheet is overheated it will strip the threads and blow down before a very destructive pressure is accumulated. On other roads the front rows of crown bolts are left without heads on the fire side for the same purpose, and then only the front portion of the crown sheet is blown down when overheated. Automatic devices, either to maintain the water supply or to act as an alarm when the proper supply is not provided, have had proper consideration, but it has been determined that such devices are unreliable, and decrease the sense of responsibility of the enginemen.

When so much depends on the regulation of the water level the gage cocks and water glass must be regarded as of prime importance, as they are the only means provided for detecting low water. Considered as safety appliances in a critical position, both of these fixtures should be used as a check on each other. The water glass does not seem to be used to the extent one would expect, although it has been materially improved in a number of ways. It has been made more safe against breakage, and the visual indication is more distinct. The Master Mechanics' Association has frequently discussed the advisability or necessity of using the water glass, and in 1893, in considering recommendations looking to increased safety, adopted a resolution "that the water glass, although a convenience and an additional precaution against low water, was not absolutely necessary to the safe running of locomotives." This was reaffirmed in 1900, but since that time boiler pressures have increased, the conditions of operation are more difficult, and the water glass has been improved.

The testimony of the locomotive builders at the hearing before the House of Representatives committee indicated that about one-half the new locomotives are not equipped with water glasses, showing that their use is by no means general. In its most improved form the water glass is not an expensive fixture, and would pay for itself as an additional insurance against burnt and blown down crown sheets, to say nothing of the greater safety assured the enginemen. The gage cocks should be substantial fixtures, and the openings into the boiler for them, as well as for the water glasses, should be frequently inspected to prevent stoppage by mud and scale.

With such provisions and precautions, the prevention of crown sheet failures due to low water depends entirely on the care and vigilance of the enginemen. Where their own lives are endangered, the occasional failure to maintane a proper level of water in the boiler, like the disregard of signals, may be due in rare instances to mental lapse, but as a rule it can be attributed to the men taking the chance that when the water is out of sight in the glass there may be 3 in. depth still on the crown sheet and that the injector will soon gain on the consumption so that water will presently appear. They find by experience that in some cases the water may be low and the sheet scorched or overheated without blowing down or doing any damage, and this leads to carelessness and willingness to take risks. The failure of crown sheets is, then, as a rule, a personal matter rather than one connected with the construction of the boiler, its strength or its inspection, and the effort to reduce these failures should be directed to the cultivation of greater care and watchfulness on the part of the enginemen.—*Railway Age Gazette.*

SEATTLE BRANCH.

The Jeffrey Manufacturing Company, of Columbus, Ohio, manufacturers of mining, elevating, conveying and power transmission machinery and coal mine equipment, have recently opened another Branch Office at 1201 American Bank Building, Seattle, Wash., from where they will handle their business in the Northwest.

Mr. Percy E. Wright, Seattle Manager, is a sales engineer, having been connected with the Home Office for the past ten years, and is thoroughly conversant with the conditions in the Northwest territory, having been traveling in this part of the country for a number of years.

The Jeffrey Manufacturing Company are maintaining 13 Branch Offices in the United States, as well as nearly 100 Agencies in the leading commercial centers all over the world.

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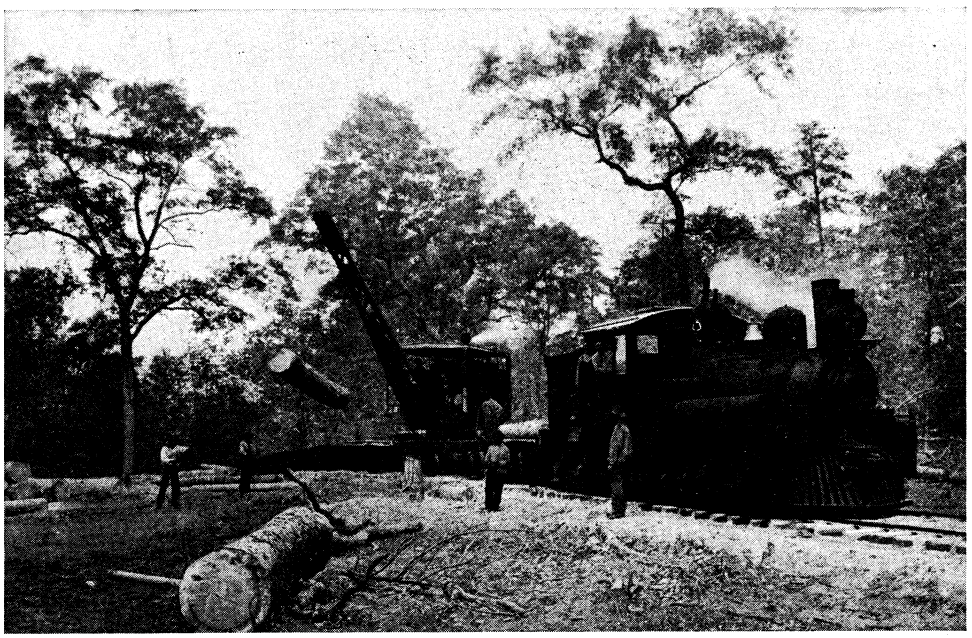

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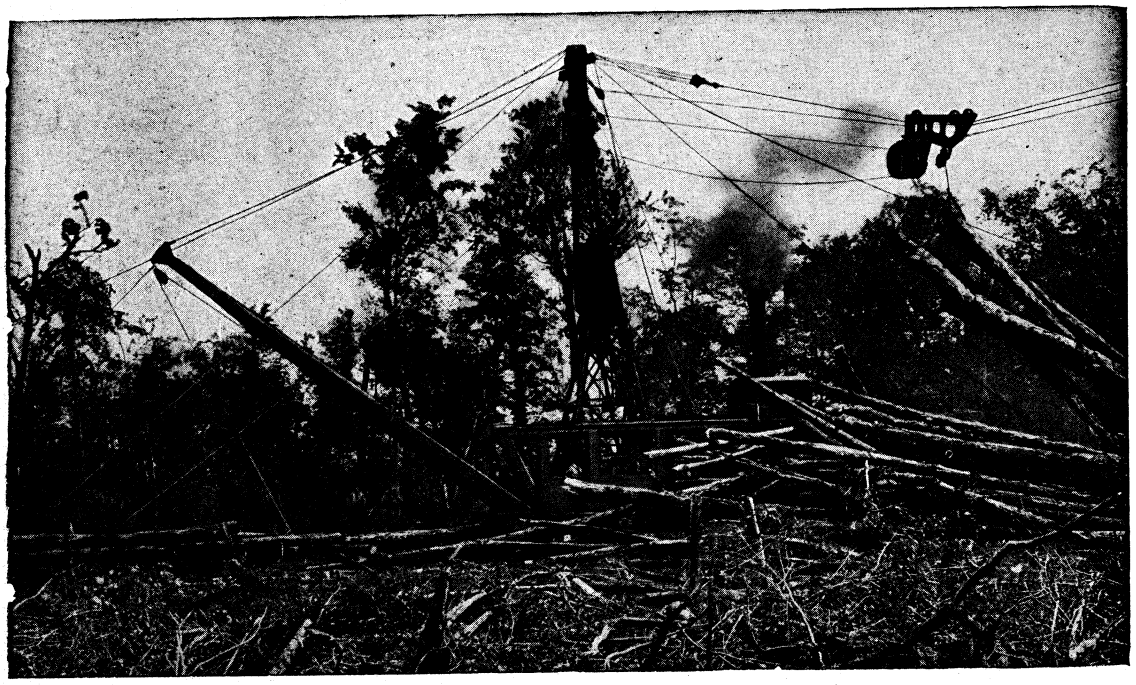

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